

Gas Turbine – Palm Wörth

Summary of Maintenance History

08.2022

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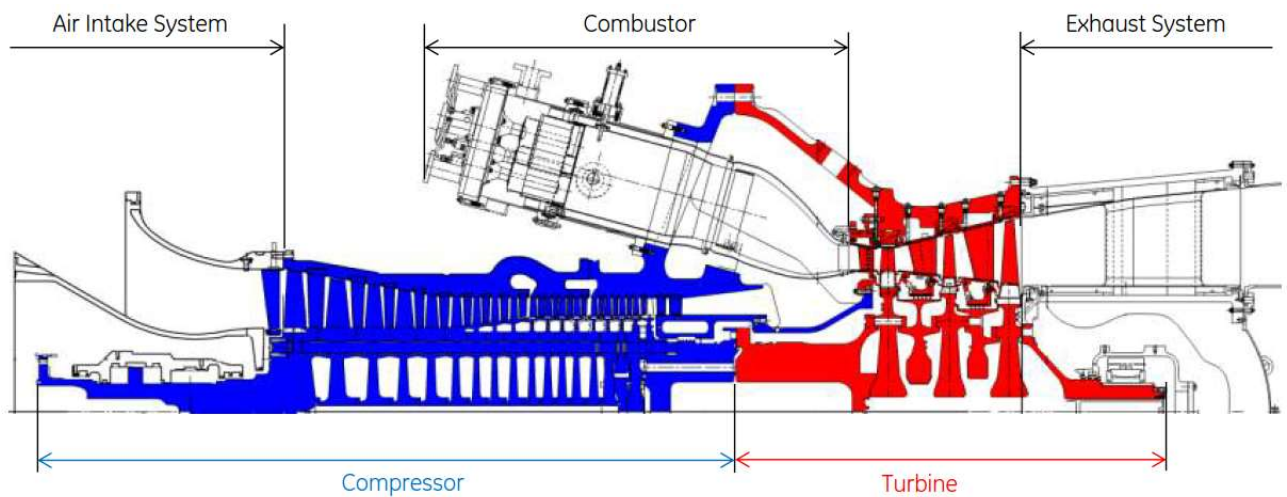
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Revision	Date	Status	Author	Checked	Approved
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1 GT UNIT OEM DATA

Gas Turbine:	Siemens Industrial Turbomachinery AB	Type: SGT800	S/N: B000562
Main Gear:	Flender Graffenstaden	Type: TX112/ 4C	S/N: 9017
Electric Generator:	Siemens Energy	Type: SGEN5-100A-4P	S/N: 12008662
Max. Capacity:	45 MWe		

2 TERMINOLOGY (GAS GENERATOR)



3 GT UNIT CURRENT STATUS AND MAIN ISSUES

Last reported OH	110,500 EOH
Last reported maintenance	A-Inspection
Major Repairs	maintained in accordance with OEM recommendations;
Exchanges	no additional work outside the normal service range
Upgrades	n/a

Detailed maintenance reports will be made available on request by interested buyer.

4 CHRONOLOGICAL MAINTENANCE HISTORY AND KEY FINDINGS

The following is a chronological summary of the most important maintenance activities and their key results. All inspections until August 2017 were executed by the Original Equipment Manufacturer Siemens Industrial Turbomachinery AB, Finspong, Sweden for the Gas Generator and Siemens Energy, Essen, Germany for the Electric Generator. One additional A-Inspection in April 2017 was executed by GE Power Services/FieldCore and from August 2018 on all inspection were executed by GE Power Services/FieldCore.

Date	EOH / Starts	Type of Inspection	Components inspected and key findings
12/2008	9,612 / 180	A-Inspection	<p>Execution of first A-inspection according to OEM maintenance plan;</p> <p>The ventilation filters for the enclosure was found assembled in the wrong way and this was corrected;</p> <p>Ventilation filters for the enclosure were found dirty;</p> <p>Insulation had fallen off the inlet casing and was touching the quill shaft;</p> <p>Minor corrosion was found on the inlet piece;</p> <p>Borescope inspection at compressor and turbine rotors were performed. Minor oxidation marks were found on top of every blade in turbine stage no. 1 and minor loss of TBC was found on fuel injector no. 20 and no. 11. A minor rubbing mark was found at 6 o'clock at the bellow between the outlet casing and the exhaust diffuser. Erosion marks were found on main gearbox pinion teeth.</p> <p>Result: Unit is in serviceable condition</p>
02/2010	33,095 / 339	A-Inspection	<p>Execution of A-inspection according to OEM maintenance plan;</p> <p>Cracks were found in the hatch for the inlet plenum of the compressor and air intake section;</p> <p>Minor corrosion was found on stator ring no. 2;</p> <p>A hot air leakage between the compressor casings and the central casing was found;</p> <p>Minor spots of corrosion were found in the central casing;</p> <p>Combustion chamber drainpipe was found out of correct position;</p> <p>The drainpipe for the combustion chamber was reinstalled during this outage;</p> <p>Oxidation was found on several parts in turbine stator stage no.1;</p> <p>A leakage was found from the exhaust diffuser manhole hatch. The leakage was sealed during this outage; erosion marks and electrical discharges were found on main wheel and on the gearbox pinion.</p>

Date	EOH / Starts	Type of Inspection	Components inspected and key findings
			Result: Unit is in serviceable condition
04/2012	41,971 / 384	C-Inspection	Execution of planned C-inspection according to OEM maintenance plan; Turbine and generator string alignment was performed; Implementation of modification orders; L2 check of the alternator was performed by the electric generator OEM.
04/2013	50,962 / 430	A-Inspection	Execution of planned A-inspection according to OEM maintenance plan; Deposits were observed at the anti-icing system; Contamination was observed at the enclosure ventilation filters and the gas turbine pre-filters; Compressor rubbing was observed between the stator casing and blades in stage no. 1 and 2; Minor surface corrosion was observed at the first stages of the compressor rotor; Minor deposits were observed in the combustor central casing; TBC losses was observed at the turbine blade stage no. 1; TBC losses and oxidation was observed at the turbine outer vane plates; Minor erosion was observed at main gear turbine side of the crown wheel; Erosion was observed at the main gear pinion.
10/2013	¹⁾	Main Gearbox opening	The main gearbox was opened by the OEM Flender to exchange the hydrostatic lifting hose at bearing no. 11.
08/2014	61,951 / 493	B-Inspection	Execution of B-inspection according to OEM maintenance plan; Minor contamination was observed in the enclosure ventilation filters; Contamination was observed in the gas turbine pre-filters; Contamination was observed on the floor in the air intake filter room; The safety door for the air intake platform was observed not to be in place; Loose insulation was observed on the rear side of the inlet casing; Oxidation and loss of TBC on the tip was observed on most of the turbine blades stage no. 1;

¹⁾ EOH and number of starts could not be verified

Date	EOH / Starts	Type of Inspection	Components inspected and key findings
			<p>The compensator pipe for MBA10CT070 was observed to be broken;</p> <p>Four supports for the ESC front and rear manifold were observed to be cracked;</p> <p>The corners of the inner outlet casing insulation cassettes were observed to be opened;</p> <p>A crack was observed in the outlet casing outer membrane;</p> <p>Discoloration was observed around the exhaust diffusor hatch. The hatch was modified during the inspection;</p> <p>Some of the insulation carpets were observed to be damaged.</p> <p>A safety check of lubrication oil system and 10 hours battery test was executed.</p> <p>The Electric Generator was inspected and found in a serviceable condition.</p>
08/2015	69,302 /533	A-Inspection	<p>Execution of A-inspection according to OEM maintenance plan;</p> <p>MO1379 Rev. 6 was implemented.</p> <p>New logic for EOH-counters was implemented.</p> <p>AS1 needs re-adjustment once again to reset the counters</p>
08/2016	76,037 / 579	D-Inspection	<p>Execution of D-inspection according to OEM maintenance plan;</p> <p>Both bleed valves have been exchanged and tested;</p> <p>Several modification orders have been performed.</p> <p>A standard PEC test has been carried out;</p> <p>A large revision of the Electric Generator was executed. The Generator windings were found in a slightly dusty condition, but all other components were found in good condition;</p> <p>During GT start up the frequency converter for the starter motor was heavily damaged by exploding capacitors:</p> <p>Gas turbine has been left running for commercial operation.</p>
04/2017	2) / 608	A-Inspection	<p>Additional unscheduled A-inspection executed by GE Power Services according to GE maintenance plan;</p> <p>Objective of the inspection was a detailed borescope inspection of the compressor, the combustor and the turbine section. In addition, the air intake system and the exhaust system were briefly inspected;</p>

2) No plausible EOH number could be verified

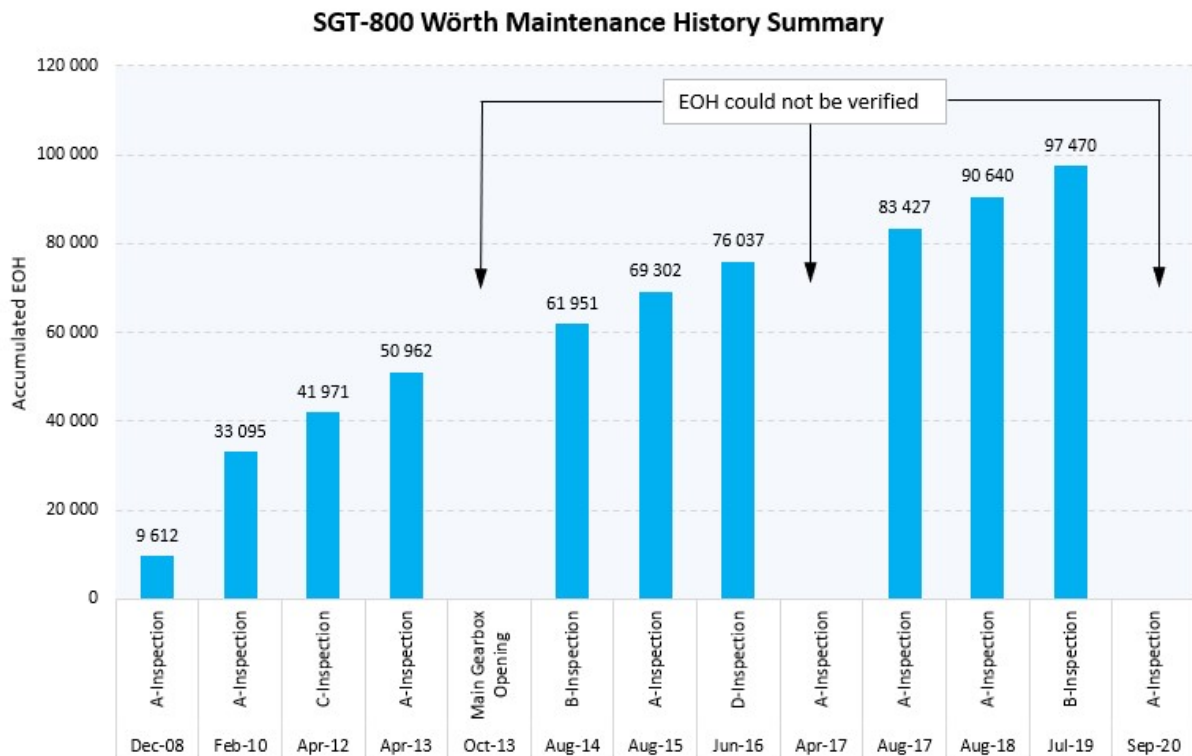
Date	EOH / Starts	Type of Inspection	Components inspected and key findings
			Result: the gas turbine was found in satisfactory condition. No significant defects were detected that require a corrective action.
08/2017	83,427 / 615	A-Inspection	Execution of planned A-inspection according to OEM maintenance plan; Minor wear was observed on the stage no. 15 abradable seal at the rear compressor stator; Two bolts were found missing in the flange for the inner cone at the exhaust diffuser. Result: Unit is in serviceable condition
08/2018	90,640 / 695	A-Inspection	Additional unscheduled A-inspection executed by GE Power Services according to GE maintenance plan; Objective of the inspection was a detailed borescope inspection of the compressor, the combustor and the turbine section. In addition, the air intake system and the exhaust system were briefly inspected; Result: air intake heater (or anti-icing system) was severely contaminated what negatively affected the unit performance; Minor fail air leaks were detected in the air intake duct; Two cracks were detected in the Combustor Forward Liner. The cracks are approx. 25 mm long.
07/2019	97470 / 800	B-Inspection	Planned B-Inspection executed by GE and FieldCore Objective of the inspection is the exchange of combustor parts and selected turbine parts that reached the lifetime end. Result: TV1, TB1, HS1, TV2, HS2 were exchanged by new or refurbished parts; The Electric Generator were visually inspected, and electric measurements were performed. Result: slight isolation damage at the stator and the rotor was detected, electrical measurements at stator, rotor, exciter and diodes show good results
09/2020	³⁾	A-Inspection	Execution of an A-inspection after the unit has been out of operation for several months Result: slight corrosion due to standstill was detected, The compressor, the combustion chamber and the turbine are in a satisfactory condition. No defects were found that appear to be of concern for the remaining planned operating time of approx. 6 months.

³⁾ EOH / Starts data could not be verified

Date	EOH / Starts	Type of Inspection	Components inspected and key findings
			Friction marks on the RTD cables of bearing no. 1 are visible in three places. The insulation cassette was defective when the manhole was opened.

5 SUMMARY

The following diagram shows an overview of the maintenance activities.



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